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BEVER, HOFFMAN & HARMS, LLP
2099 GATEWAY PLACE
SUITE 320
SAN JOSE, CA 95110

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| EXAMINER |
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PATEL, SHAMBHAVI K

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| ART UNIT | PAPER NUMBER |
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2128

DATE MAILED: 11/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/773,058

Applicant(s)

KUCUKCAKAR ET AL.

Examiner

Shambhavi Patel

Art Unit

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— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-44 are pending.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 44 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The claim is directed to determining which scenarios should be optimized, and optimizing the selected scenarios simultaneously in logic synthesis, placement, and routing. The only support found for this in the specification is:

As such, many modifications and variations will be apparent. For example, a method of designing digital circuits could include performing a plurality of static timing analysis for different operation modes, manufacturing process corners, on operating conditions, or ambient environment conditions. The method could further include determining which scenarios should be simultaneously optimized and then optimizing selected scenarios simultaneously in logic synthesis, placement, and routing (last page)

The Examiner asserts that this is not a specific teaching as to how a skilled artisan would realize the claimed 'determining which scenarios should be optimized, and optimizing the selected scenarios simultaneously in logic synthesis, placement, and routing'.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claims 25-33 are rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claim 25, the language of the claim does not clearly convey whether the Applicant is claiming a computer program or an electromagnetic wave. The Examiner interprets the claim to be directed to a computer program. All other claims are rejected by virtue of their dependency.
4. **Claim 44 is rejected under 35 U.S.C. 112, second paragraph**, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim and the specification fail to define the term 'scenario'. The Examiner interprets the term to mean any portion (i.e. node, wire, etc.) of the circuit.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. **Claims 25-33 and 44 are rejected under 35 U.S.C. 101** because the claimed invention is directed to non-statutory subject matter.

Regarding claim 25:

As per the 35 U.S.C. 112 rejection above, it is not clear whether claim 25 is directed to an electromagnetic wave or a computer program. An electromagnetic wave is non-statutory subject matter, because a signal does not fall into any of the four categories of invention. A computer program is non-statutory subject matter because it is software per se, and lacks storage on a medium that enables any

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underlying functionality to occur.

Regarding claim 44:

The Examiner asserts that the current state of the claim language is such that a reasonable interpretation of the claims would not result in any useful, concrete or tangible product. Merely optimizing the synthesis, placement, and routing of the circuit does not produce a tangible result.

All other claims are rejected by virtue of their dependency.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-11, 14-38 and 41-43 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Schulz ('Focus Report: Timing Analysis' 2000).

Regarding claims 1 and 20:

Schulz discloses a method of performing static timing analysis on a design, the method comprising:

- a. performing multiple static timing analysis runs with the design, each run using a predetermined set of parameters ('A Look Under the Hood' 5th paragraph). The prior art discloses tools that are capable of performing minimum/maximum delay analysis (i.e.

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multiple runs are needed, one to account for the minimum delay and a second to account for the maximum delay).

- b. saving results from the multiple static timing analysis runs and merging the results ('A Look Under the Hood', 2nd paragraph). Once the runs are completed, the data is collected and presented to the user in reports and various visualization tools.

Regarding claim 20, Schulz further discloses producing a report from the merged reports ('A Look Under the Hood', 2nd paragraph).

Regarding claim 2:

Schulz discloses the method of claim 1, wherein the multiple static timing analysis runs are independent ('A Look Under the Hood' 5th paragraph). The prior art discloses tools that are capable of performing minimum/maximum delay analysis (i.e. multiple runs are needed, one to account for the minimum delay and a second to account for the maximum delay). Since the runs account for two different delays, they cannot share information and are thus independent.

Regarding claim 3:

Schulz discloses the method of claim 1, wherein the multiple static timing analysis runs share information ('A Look Under the Hood' 1st-2nd paragraphs). The tool parses the netlist, maps it into a target library, and creates a list of paths. This list is then shared amongst the runs as they prune the paths according to their criteria, and then compute values for the cells and interconnects incorporating timing or parasitic data.

Regarding claim 4:

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Schulz discloses performing the multiple static timing analysis runs in parallel (**'Putting Timing Analysis Tools to Work'** 7th paragraph). The prior art discloses single-pass analysis of best/worst case conditions in order to minimize cycle time.

Regarding claim 5:

Schulz discloses performing the multiple static timing analysis runs in series (**'More Bells and Whistles'** 2nd paragraph). The prior-art discloses what-if analysis, which allows for on-the-fly variations (i.e. multiple runs in series).

Regarding claim 6:

Schulz discloses forming a database that can be queried at different levels of detail (2nd paragraph; **'Putting Timing Analysis Tools to Work'** 9th-10th paragraphs). The user can obtain exhaustive timing analysis reports, reports that emphasize trouble areas, or waveform models of selected critical paths.

Regarding claim 7:

Schulz discloses restoring (i.e. reading) the database and making additional queries (**'A Look Under the Hood'** 2nd paragraph). The reports and visualization tools can provide results sorted according to the user preferences (i.e. the user can query the database to access desired information).

Regarding claim 8:

Schulz discloses querying from one or more runs (**'A Look Under the Hood'** 2nd paragraph). After the timing verifier engine calculates slack and constraint violations (two separate runs), the results of both runs are presented to the user.

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Regarding claim 9:

Schulz discloses adding additional results to the saved results of each run during each query ('More Bells and Whistles' 2nd paragraph).

Regarding claim 10:

Schulz discloses a predetermined set of parameters includes a mode and a corner ('A Look Under the Hood' 5th paragraph). The prior art discloses min/max analysis (corner cases) and mode analysis.

Regarding claim 11:

Schulz discloses the method of claim 10, wherein the predetermined set of parameters include a plurality of modes and corners ('A Look Under the Hood' 5th paragraph), wherein the multiple static timing analysis runs share information, and wherein the plurality of modes and corners are automatically analyzed to determine shared information between parallel runs ('A Look Under the Hood' 1st-2nd paragraphs). The tool parses the netlist, maps it into a target library, and creates a list of paths. This list is then shared amongst the runs as they prune the paths according to their criteria, and then compute values for the cells and interconnects incorporating timing or parasitic data.

Regarding claim 14:

Schulz discloses the method of claim 1, wherein the saved results include results of predetermined queries ('A Look Under the Hood' 2nd paragraph). If the engine calculates slack and constraints violations, the reports containing this data are then presented to the user.

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Regarding claim 15:

Schulz discloses the method of claim 1, wherein the saved results include cell delays, net delays, transition times, path reports, bottleneck reports, modes, slack, and constraints (**'An Introduction Please' 2nd paragraph; 'A Look Under the Hood' 2nd, 5th-6th paragraphs; 'Putting Timing Analysis Tools to Work' 9th paragraph**).

Regarding claim 16:

Schulz discloses reporting the merged results including cell delays, net delays, transition times, path reports, bottleneck reports, modes, slack, and constraints (**'An Introduction Please' 2nd paragraph; 'A Look Under the Hood' 2nd, 5th-6th paragraphs; 'Putting Timing Analysis Tools to Work' 9th paragraph**).

Regarding claim 17:

Schulz discloses allowing multiple modes and corners to be analyzed simultaneously (**'Putting Timing Analysis Tools to Work' 7th paragraph**). The prior art discloses single-pass analysis of best/worst case conditions in order to minimize cycle time.

Regarding claim 18:

Schulz discloses modifying a predetermined set of parameters after completing an initial multi-mode/multi-corner analysis, and performing an analysis to provide a what-if capability (**'More Bells and Whistles' 2nd paragraph**).

Regarding claim 19:

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Schulz discloses the method of claim 10, wherein desired information regarding a predetermined set of modes/corners can be merged before other information ('A Look Under the Hood' 2nd paragraph). The reports are sorted according to user preference.

Regarding claim 21:

Schulz inherently discloses saving the results in a database. The prior art discloses compiling the results to produce a report ('A Look Under the Hood', 2nd paragraph) and in order to this, the data would first be saved.

Regarding claim 22:

Schulz discloses forming a database that can be queried at different levels of detail (2nd paragraph; 'Putting Timing Analysis Tools to Work' 9th-10th paragraphs). The user can obtain exhaustive timing analysis reports, reports that emphasize trouble areas, or waveform models of selected critical paths.

Regarding claim 23:

Schulz discloses the report of claim 20, wherein the set of automatically merged results in user specified ('A Look Under the Hood', 2nd paragraph).

Regarding claim 24:

Schulz discloses the report of claim 20, wherein the set of merged results is determined in advance of each run ('Putting Timing Analysis Tools to Work' 9th paragraph).

Regarding claim 25:

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Schulz discloses a computer tool that comprises instructions for:

- a. performing multiple static timing analysis runs with the design, each run using a predetermined set of parameters (**'A Look Under the Hood' 5th paragraph**). The prior art discloses tools that are capable of performing minimum/maximum delay analysis (i.e. multiple runs are needed, one to account for the minimum delay and a second to account for the maximum delay).
- b. saving results from the multiple static timing analysis runs and merging the results (**'A Look Under the Hood', 2nd paragraph**). Once the runs are completed, the data is collected and presented to the user in reports and various visualization tools.

Regarding claim 26:

Schulz discloses independent multiple static timing analysis runs ('A Look Under the Hood' 5th paragraph). The prior art discloses tools that are capable of performing minimum/maximum delay analysis (i.e. multiple runs are needed, one to account for the minimum delay and a second to account for the maximum delay). Since the runs account for two different delays, they cannot share information and are thus independent.

Regarding claim 27:

Schulz discloses sharing information within the multiple static timing analysis runs ('A Look Under the Hood' 1st-2nd paragraphs). The tool parses the netlist, maps it into a target library, and creates a list of paths. This list is then shared amongst the runs as they prune the paths according to their criteria, and then compute values for the cells and interconnects incorporating timing or parasitic data.

Regarding claim 28:

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Schulz discloses performing the multiple static timing analysis runs in parallel (**'Putting Timing Analysis Tools to Work'** 7th paragraph). The prior art discloses single-pass analysis of best/worst case conditions in order to minimize cycle time.

Regarding claim 29:

Schulz discloses performing the multiple static timing analysis runs in series (**'More Bells and Whistles'** 2nd paragraph). The prior-art discloses what-if analysis, which allows for on-the-fly variations (i.e. multiple runs in series).

Regarding claim 30:

Schulz discloses forming a database that can be queried at different levels of detail (2nd paragraph; **'Putting Timing Analysis Tools to Work'** 9th-10th paragraphs). The user can obtain exhaustive timing analysis reports, reports that emphasize trouble areas, or waveform models of selected critical paths.

Regarding claim 31:

Schulz discloses a predetermined set of parameters includes a mode and a corner (**'A Look Under the Hood'** 5th paragraph). The prior art discloses min/max analysis (corner cases) and mode analysis.

Regarding claim 32:

Schulz discloses allowing multiple modes and corners to be analyzed simultaneously (**'Putting Timing Analysis Tools to Work'** 7th paragraph). The prior art discloses single-pass analysis of best/worst case conditions in order to minimize cycle time.

Regarding claim 33:

Schulz discloses merging the desired information regarding a predetermined set of modes/corners before merging the other information (**'A Look Under the Hood' 2nd paragraph**). The reports are sorted according to user preference.

Regarding claim 34:

Schulz discloses a method of performing static timing analysis on a design, the method comprising:

- a. performing multiple static timing analysis runs with the design, each run using a predetermined set of parameters (**'A Look Under the Hood' 5th paragraph**). The prior art discloses tools that are capable of performing minimum/maximum delay analysis (i.e. multiple runs are needed, one to account for the minimum delay and a second to account for the maximum delay).
- b. saving results from the multiple static timing analysis runs, and reading and reporting the results (**'A Look Under the Hood', 2nd paragraph**). Once the runs are completed, the data is collected and presented to the user in reports and various visualization tools.

Regarding claim 35:

Schulz discloses forming a database that can be queried at different levels of detail (**2nd paragraph; 'Putting Timing Analysis Tools to Work' 9th-10th paragraphs**). The user can obtain exhaustive timing analysis reports, reports that emphasize trouble areas, or waveform models of selected critical paths.

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Regarding claim 36:

Schulz discloses restoring (i.e. reading) the database and making additional queries ('A Look Under the Hood' 2nd paragraph). The reports and visualization tools can provide results sorted according to the user preferences (i.e. the user can query the database to access desired information).

Regarding claim 37:

Schulz discloses querying from one or more runs ('A Look Under the Hood' 2nd paragraph). After the timing verifier engine calculates slack and constraint violations (two separate runs), the results of both runs are presented to the user.

Regarding claim 38:

Schulz discloses adding additional results to the saved results of each run during each query ('More Bells and Whistles' 2nd paragraph).

Regarding claim 41:

Schulz discloses saving results of predetermined queries ('A Look Under the Hood' 2nd paragraph). If the engine calculates slack and constraints violations, the reports containing this data are then presented to the user.

Regarding claim 42:

Schulz discloses saving cell delays, net delays, transition times, path reports, bottleneck reports, modes, slack, and constraints ('An Introduction Please' 2nd paragraph; 'A Look Under the Hood' 2nd, 5th-6th paragraphs; 'Putting Timing Analysis Tools to Work' 9th paragraph).

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Regarding claim 43:

Schulz discloses reporting the merged results including cell delays, net delays, transition times, path reports, bottleneck reports, modes, slack, and constraints ('An Introduction Please' 2nd paragraph; 'A Look Under the Hood' 2nd, 5th-6th paragraphs; 'Putting Timing Analysis Tools to Work' 9th paragraph).

5. Claim 44 is rejected under 35 U.S.C. 102(b) as being clearly anticipated by Jiang ('Post-Layout Logic Restructuring for Performance Optimization' 1997).

Regarding claim 44:

Jiang discloses a method of designing digital circuits, the method comprising:

- a. performing a plurality of static timing analysis for different operation modes or manufacturing process corners on operating conditions, or ambient environment conditions and determining which should be simultaneously optimized ('2. Post-Layout Performance Optimization'). The prior art discloses extracting interconnection delays and identifying timing-critical wires using a static timing analyzer.
- b. optimizing selected scenarios simultaneously in logic synthesis, placement, and routing (figure 1)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior

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art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 12, 13, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schulz ('Focus Report: Timing Analysis' 2000).

Regarding claims 12, 13, 39 and 40:

Schulz discloses saving results include a predetermined set of parameters that are used in creating additional results ('A Look Under the Hood' 4th paragraph). Schulz discloses the features of generic static timing analysis tools, which teach the limitations of the parent claim(s). The prior art further discloses features of a specific tool, SST Velocity, which can automatically identify clock domains (parameters). The generic timing tools and the specific timing tools disclosed by Schulz are analogous art (static timing analysis tools), and it would have been obvious to one of ordinary skill in the art to combine the multiple teachings of Schulz because automatically identifying clock domains eliminates false paths

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so that the remaining synchronous logic can be properly analyzed ('A Look Under the Hood' 4th paragraph).

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shambhavi Patel whose telephone number is (571) 272-5877. The examiner can normally be reached on Monday-Friday, 8:00 am – 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571) 272-2279. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SKP


FRED FERRIS
PRIMARY EXAMINER
TECHNOLOGY CENTER 2100